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THE ECONOMICS AND PRODUCTION OF ESTABLISHING AND GRAZING FORAGES IN COMPARISON TO CEREAL IN THE BLACK SOIL ZONE OF SASKATCHEWAN

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The Economics and Production of Establishing and Grazing Forages in Comparison to Cereal Crops in the Black Soil Zone of Saskatchewan

FINAL REPORT
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EXECUTIVE SUMMARY

This project is focused on comparing economic and production differences between returns from a forage based agriculture system vs. a grain based system in the thin Black Soil zone of Saskatchewan. The objective of this project is to evaluate pasture and animal production from grazing traditional and hybrid forages. As well, an economic comparison of establishment and returns from forage systems to traditional cereal cropping.

By comparing forage management returns to revenues and expenses from traditional cereal cropping in the Black soil zone of Saskatchewan, researchers will be able to provide producers with valuable information regarding the transition of marginal cropland to forage production. This study will complement similar information already available for the Brown soil zone of Saskatchewan.

This study will provide valuable information to producers on the costs associated with first establishing forages into cultivated land, then subsequently the productivity and quality of the crop and animal gains from grazing the different species. This information will be compared to the costs of cereal production on the same land base.

INTRODUCTION

Pasture forage is an important part of beef production systems in western Canada and producers require species adapted to their region, which are high yielding and provide good nutritional quality. New germplasms intended for pasture in Saskatchewan are routinely evaluated in trials involving simulated harvesting techniques (Knowles 1987). However, frequent mechanical harvests fail to impose animal effects on grasses such as trampling, pulling of plants, deposition of feces and urine and short stubble heights.

Beef producers need information on how new species perform under grazed conditions in order to decide whether to include the forage in their management plan. Choice of grass species and cultivars to include in a grazing system will influence both the forage quality and yield potential of a pasture both of which have a direct impact on livestock production because of their relationship to intake and digestibility of nutrients (Irvine and Lawrence 1982).

In western Canada, smooth bromegrass and crested wheatgrass have been widely utilized as pasture forages for grazing animals (McCartney and Bittman 1994). Due to their wide adaptation to climate and soils, these two species have been recommended both for use in pasture and hay crops in Saskatchewan. Previous research has shown that crested wheatgrass begins growth early in the spring and is of high quality at this time (Hoffman et al. 1993). Steer weight gains on crested wheatgrass pasture reported in the literature, have ranged from 0.79 to 1.60 kg d^{-1} (Hart et al. 1983; Hoffman et al. 1993; Vogel et al.1993; Karn et al. 1999). However, as crested wheatgrass matures, quality decreases at a rapid rate (Hart et al. 1983). It is for this reason that crested wheatgrass is often included in grazing plans as complementary forage, for early spring grazing.

Smooth bromegrass is a drought-tolerant, sod-forming, cool-season perennial, which has been included in many forage improvement trials over the past 50 years (Vogel et al. 1996). The result of these studies has increased yield, quality, and resistance of this grass to diseases (Casler et al. 2000). Average daily gains of 0.86 to 1.02 kg d^{-1} have been reported on pure stands of smooth bromegrass (Hoffman et al. 1993; Karn et al. 1999). However, due to the slow regrowth observed with this species, smooth bromegrass is better suited to hay production than pasture production.

More recently meadow bromegrass, a bunch-type species, has been introduced as a forage alternative for use in livestock production systems. This grass offers increased regrowth potential in comparison to smooth bromegrass, and is commonly recommended for pasture (Knowles et al. 1993). Past grazing research using meadow bromegrass has mainly compared mixtures of this grass with alfalfa, as there is little published information reporting performance of cattle grazing pure stands of meadow bromegrass. However, in earlier studies, meadow bromegrass produced animal gains of 0.72 to 0.86 kg d^{-1} (Knowles et al. 1993). It was also suggested that this grass would be useful as a dual purpose species. The basal nature of the leaves often poses difficulties when cutting and curing for hay. Therefore this grass is better suited for pasture use.

In the early 1980's, a program was initiated to incorporate desirable characteristics by crossing smooth bromegrass and meadow bromegrass cultivars into a hybrid bromegrass that could be use for both hay and pasture (Knowles and Baron 1990). The hybrid is, for most characteristics, intermediate to the two parental species. However, it is closer to the

reduced creeping habit of meadow bromegrass. Like meadow bromegrass, the hybrid is capable of elongating cut tillers, thus regrowth after a cut is superior to smooth bromegrass. The hybrid also carries its leaves somewhat higher in the sward than meadow bromegrass, making it more suitable for haymaking (Ferdinandez and Coulman 2000). This species was developed to offer increased flexibility in forage management systems. Preliminary testing in small plot trials indicates that the yield and forage quality of this grass show potential for use in beef production systems. However, animal data are needed to adequately evaluate this grass species for pasture use.

PROJECT SETUP

The objectives of this study were to evaluate animal performance and forage utilization of steers grazing hybrid bromegrass pasture in comparison to grazing smooth bromegrass, meadow bromegrass and crested wheatgrass.

A two-year grazing trial was conducted on a 6.4-ha pasture located near Lanigan, Saskatchewan (51°51' N; 105°02' W) at the Western Beef Development Centre's Termuende Research Farm. Two, 0.8-ha replicates each of smooth bromegrass (*Bromus inermis* Leyss.), cv. Carlton, meadow bromegrass (*Bromus beibersteinii* Roem. & Schult.), cv. Paddock and hybrid bromegrass (*Bromus riparius X Bromus inermis*), cv. AC Knowles (S-9197) were established in July of 1999. Two replicates of long established crested wheatgrass (*Agropyron pectiniforme* R. & S.) (cultivar unknown) from an adjacent pasture were also included in the experiment. Topography at the pasture site (NW-22-33-21-W2) is gently to moderately hummocky and the soils were a mixture of Oxbow Orthic Black and carbonated Oxbow with a loam texture.

Prior to seeding, the site was sprayed with glyphosate [(N-phosphono-methyl) glycine] at 2.0 kg ha^{-1} active ingredient to facilitate weed control. Following this the seedbed was prepared in June by cultivation with a light tandem disc. All bromegrass pasture species were established July 7 1999. Seeding rates were 16 kg ha^{-1} for smooth bromegrass, and 20 kg ha^{-1} for meadow bromegrass and hybrid bromegrass due to the larger seed size of these species. Some overseeding was necessary early spring 2002 on all bromegrass paddocks in due to variable establishment. The crested wheatgrass

pastures were long established stands located adjacent to the newly established bromegrass pastures. All pastures were 0.8 ha in size.

Soil samples collected in the spring of 2000 and 2001 indicated available N levels of 150 and 49 kg ha^{-1}, P_2O_5 at 75 and 48 kg ha^{-1}, K_2O at 1200 and 1210 kg ha^{-1}, and S levels of 96 kg ha^{-1}, respectively. Nitrogen fertilizer (46-0-0) was applied prior to each growing season in early spring at 56 kg N ha^{-1}. The herbicide Kerb 50-W (Rohm and Haas Canada Inc.) was spot sprayed (1.1 kg ha^{-1}) to control foxtail barley (*Hordeum jubatum* L.) in the fall of 2000. Refine Extra Toss-N-Go (DuPont Canada Inc.) was surface applied spring 2001 at 8 gm ha^{-1} to control broadleaf weeds.

Weather records for 2000 and 2001 including daily maximum and minimum temperatures and daily precipitation were obtained from a weather station located on the Termuende Research Farm. Monthly precipitation for May, June, July, August and September 2000 was 28.3, 92.8, 28.2, 30.9 and 19.4 mm, respectively. Monthly precipitation for May, June, July, August and September 2001 was 31.2, 9.2, 78.4, 3.1 and 21.8 mm, respectively. Long-term average yearly precipitation for the Lanigan area is 257 mm (1960 –1999) (Environment Canada 1999). Mean average daily temperatures, May, June, July, August and September 2000 were 18.1, 22.7, 25.5, 24.0 and 18.6 °C, respectively. Mean average daily temperatures, May, June, July, August and September 2001 were 19.6, 22.5, 26.6, 27.9 and 21.6 °C, respectively.

Steer production was evaluated using a 'put and take' grazing system with 3 tester animals per paddock to balance pasture production with animal demand. Sufficient 'put and take' animals were added to each pasture to maintain similar forage availability in all pastures. British X Continental steers were weighed and randomly assigned to one of four pasture types according to body weights. Steers began grazing pastures when sufficient herbage was available, at an approximate plant height of 15 to 18 centimeters. Stocking rates varied from 6 animals ha^{-1} in June to 4 animals ha^{-1} in July and August. Paddocks were managed to obtain at least three weeks of grazing. Steers remained on each pasture until plants were grazed to a uniform level of approximately 5 centimetres. Crested wheatgrass pastures were grazed in May due to the early maturity characteristics of this species. Paddocks were grazed for two grazing periods in 2001 and one grazing period in 2000 due to insufficient forage regrowth. Crested wheatgrass paddocks were

grazed May 23 to July 6 and May 23 to June 13 in 2000 and 2001, respectively. The grazing season for all the bromegrass pastures was from June 23 to August 3 in 2000 and June 6 to June 27 (period 1) and August 7 to August 28 (period 2) in 2001. Pastures were allowed an adequate rest period and animals were returned when sufficient forage was available. Between grazing periods, all steers grazed in a common holding pasture.

RESULTS & DISCUSSION

A complete interpretation of all results pertaining to this project would be too lengthy for this report. The following is a sampling of experiments conducted and any significant discussion. For more detail on the project refer to the various publications listed in the Project Extension Activities section.

Initial steer weights averaged 310 kg ± 147 and 298 kg ± 115 per animal in 2000 and 2001, respectively. Steers were weighed weekly during each grazing period in both years. Steers were weighed at a consistent time of each day, but were not fasted due to the lack of appropriate holding facilities. All animals had *ad libitum* access to water and throughout the grazing season were fed a cobalt iodized salt and 1:1 range mineral (Feed Rite, Division of Ridley Inc) on a free choice basis. All animals were handled according to the Guidelines of the Canadian Council on Animal Care (1993).

Forage utilization was measured to estimate the consumption of each pasture herbage by sampling prior to grazing and sampling again immediately after grazing as described by ('t Mannetje 1978). Samples were taken in each replicate to determine the total above ground biomass. Utilization (%) was determined by clipping from within each pasture replicate, prior to and after grazing, three randomly placed 0.25 m^2 quadrats (0.5 m x 0.5 m), to a 1.5 cm stubble height.

The experiment consisted of a completely random design with the four grass species as treatments with two pasture replicates. Data are reported as means including average daily gain (ADG), animal grazing days (AGD), total beef production (TBP) and pasture utilization and were analyzed using the GLM procedure of SAS for analysis of variance (SAS Institute Inc. 1999). Body weight gain was determined with individual

animals as experimental units. Animal grazing days and TBP were determined with pasture replicates (3 animals each) as experimental units, and TBP as the quotient of ADG and AGD.

Steer performance data for 2000 and 2001 were analyzed separately due to a significant interaction ($P<0.05$) between years for ADG, AGD, TBP and pasture utilization. Analysis of covariance showed that initial weights did not have a significant effect ($P>0.05$) on any of the calculate means in 2000 or 2001. In 2000, differences ($P<0.05$) were detected between average daily gain (kg d^{-1}) and animal grazing days (d ha^{-1}) from cattle grazing the study grasses (Table 1). Weight gain was significantly greater ($P<0.05$) for steers grazing hybrid bromegrass than other pasture types. These gains (1.62 kg d^{-1}) are higher than the 1.0 kg d^{-1} reported by Coulman (1999). Average daily gain (1.03 kg d^{-1}) for crested wheatgrass pastures were similar to those described in other studies (Hart et al. 1983; Vogel et al. 1993). Weight gains on the smooth bromegrass pastures (1.25 kg d^{-1}) were higher than those reported by Hoffman et al. (1993) and Karn et al. (1999), where no fertilizer was applied, whereas in the present study, fertilizer was applied each spring. Average daily gain on the meadow bromegrass paddocks were higher than those reported by Knowles et al. (1993) where heifers were used for grazing, whereas the current study used steers. Total beef production in 2000 was greatest (160 kg ha^{-1}) from animals grazing hybrid bromegrass paddocks.

In 2001, average daily gain and total beef production data reflected differences in period of use of the different pasture types (Table 1). Crested wheatgrass pastures were grazed in May when pastures received 31.2 mm rainfall, compared to 9.2 mm precipitation recorded in June when bromegrass paddocks were grazed. Animal performance data were analyzed by grazing period and over the entire grazing season. Weight gain during the first grazing period in 2001 was greater ($P<0.05$) on the crested wheatgrass pasture than any bromegrass species (Table 1). No differences ($P>0.05$) were observed between bromegrass species for average daily gain in any grazing period. However, in grazing period 2, weight gains were numerically greater than period 1 performance for all bromegrass pastures. This increase may have been due to recommended mid season use of bromegrasses from regrowth (Knowles and Baron 1990; Knowles et al. 1993), or may have been related to compensatory gain of the animals.

However, steer weight gain tended to be greater (1.07 kg d^{-1}) but not significant on hybrid bromegrass paddocks compared to gains from smooth bromegrass (0.77 kg d^{-1}) or meadow bromegrass (0.94 kg d^{-1}) pastures in year two.

Animal grazing days between pasture species did not differ within grazing periods in 2001 (Table 1). However, for total animal grazing days over the grazing season, hybrid bromegrass was significantly greater ($P<0.05$) than crested wheatgrass, but not different ($P>0.05$) from the parent species. This would suggest that hybrid bromegrass is a suitable pasture species and performs similar to the parent species under grazing conditions. More AGD were observed on all pastures in grazing period 1 of 2001 compared to grazing period 2 (Table 1). This trend may be explained by the difference in forage utilization between the two periods (Table 2). The greater forage utilization in grazing period 1 allowed steers to graze for a greater number of days.

Total beef production (kg ha^{-1}), was greater from the crested wheatgrass pastures in grazing period one in 2001. This was a reflection of the greater average daily gain of steers observed from these paddocks. No significant differences ($P>0.05$) were observed for TBP in grazing period two or for the total grazing season, between any of the treatment species in both years (Table 1). However, hybrid bromegrass pastures did have the highest numerical value (185 kg ha^{-1}) for total beef production in 2001.

Percent forage utilization was calculated following each grazing period in 2000 and 2001 and data was analyzed separately. In 2000, smooth bromegrass had significantly greater forage utilization ($P<0.05$) than meadow bromegrass and crested wheatgrass, but was not different from hybrid bromegrass (Table 2). This trend was reversed in grazing period 1 of 2001, when smooth bromegrass had the least ($P<0.05$) percent forage utilization, but was still not different from hybrid bromegrass. During grazing period 2, smooth bromegrass again had significantly greater ($P<0.05$) forage utilization than the other bromegrass species.

These differences in forage utilization between the study grasses may have been due to the inherent differences in growth habit and morphology of these species (Knowles and Baron 1990). Smooth bromegrass is an upright growing species that carries its leaves higher on the plant, therefore when an animal grazes this species, most of the leaf material will be removed. Meadow bromegrass plants consist of many basal

leaves lower down nearer the crown. When this species is grazed, proportionately less leaf material is removed when compared to smooth bromegrass (Knowles 1993). As hybrid bromegrass is a cross between smooth and meadow bromegrass, it could be expected to fall between the two parents with respect to leaf location on the plant (Ferdinandez and Coulman 2000) and therefore, forage utilization. This was observed in grazing period 1 of both 2000 and 2001(Table 2). However, in grazing period 2 of 2001, hybrid bromegrass utilization was not different ($P>0.05$) from meadow bromegrass.

PASTURE PRODUCTION

Over the two years of this study, there were no significant differences were between forage yields (Table 4.1). However, there was a great deal of variation observed in the production data. This may be a result of poor establishment, small plot size or below average rainfall observed at the research farm. In 2000, smooth bromegrass had the highest yield. With only one grazing period, regrowth of grasses was not considered in cumulative yield. In the second year of this study, sufficient regrowth was observed on the bromegrass paddocks to allow a second grazing period. Hybrid bromegrass had superior yields compared to its parent species in both grazing periods of 2001. Dry matter yield indicated that both hybrid and meadow had more uniform distribution of yield between the two grazing periods, whereas smooth bromegrass produced most of its yield in the 1st grazing period. These finding suggest that hybrid bromegrass is better adapted for pasture than smooth bromegrass. This is due to the increased regrowth potential of the new cultivar.

PASTURE QUALITY

Tables 4.2 to 4.5 indicate the quality of all forage samples for 2000 and 2001. All bromegrass pasture samples had better forage quality than the crested wheatgrass pastures. Smooth, meadow and hybrid bromegrass had greater crude protein, lower neutral and acid detergent fiber and acid detergent lignin than crested wheatgrass. This would indicate improved digestibility of these species, which was shown by the higher *in*

vitro digestibility. All pastures received fertilizer in the spring and forage quality was still superior among the bromegrass samples compared the crested wheatgrass samples. Forage quality was more than adequate for growing 600 lb steers on grass (National Research Council 1996).

Hybrid bromegrass samples for all quality constituents were intermediate to smooth and meadow bromegrass. This species held its forage quality well throughout grazing periods producing high quality regrowth. These results suggest that hybrid bromegrass can be used as pasture forage successfully in Saskatchewan.

ECONOMIC COMPARISON OF CROPPING SYSTEMS

An economic comparison was calculated between types of cropping systems grain-based vs grass-based (Table 5).

The returns and expenses from the 'Hybrid Bromegrass Study' were compared against cereal grain production in the Lanigan area, which has been annually cropped for many years. Also included are returns per acre calculated from the Lanigan-Watrous area evaluating the cash returns of yearlings grazing crested wheatgrass and Russian wild rye pastures. This study predicted the performance of animals grazing these pasture types using Grass Gro®, a computer modeling program. Finally, costs and returns are calculated from the crested wheatgrass, smooth, meadow and hybrid bromegrass pastures.

Long term crop production in the Lanigan area for spring wheat and feed barley was determined to be 31.5 and 48.5 bushels/acre, respectively. This generated $148.05 and $112.03/acre **net revenue** for these crops. Total costs (**variable and fixed**) for spring wheat and feed barley were $123.32 and $121.27/acre, respectively (Table 5). Finally, the **return to labour and equity and personal draw** ($/acre) for spring wheat was $24.73 and for feed barley, -$9.24/acre.

Predicted value using Grass Gro® of steers (2.4 steers/acre) grazing crested wheatgrass and Russian wild rye pasture in the Lanigan-Watrous area was $2,219.00. Total **fixed and variable costs** from this simulation were $2,179.00. Therefore, predicted **return to labour and equity and personal draw** was $39.52 per acre. This

estimation of animal production from a grass-based operation would seem to be sustainable.

Finally, calculating the returns of beef production per acre from each of the four pasture types is as follows. Steers grazing eight acres of crested wheatgrass (2000 & 2001) gained 636 pounds. This was valued at $0.40 per pound of gain, which equaled $254.40. Steers grazing meadow, smooth and hybrid pastures produced 1,248, 1,361 and 1,304 pounds of beef, respectively. This was valued at $499.20, $544.51 and $521.47. Therefore the **total revenue** ($/acre) for steers grazing crested wheatgrass, meadow, smooth and hybrid bromegrass pastures was $31.80, $62.40, $68.06 and $65.18, respectively. However, total costs (**fixed and variable**) for steers grazing crested wheatgrass, meadow, smooth and hybrid bromegrass pastures were $16.59, $36.11, $36.11, and $36.11. This left a value of $15.21, $26.29, $31.95 and $29.07 dollars per acre for **return to labour and equity and personal draw**.

Based on these studies it would be prudent to suggest that returns from established grass production system are very comparable, if not superior to returns from growing cereal crops. Finally, use decision support systems such as Grass Gro® simply as tools to predict animal performance and possible returns. In this example net returns to labour and equity from Grass Gro®, were validated with the field data. However, it is the impact of many environmental factors on pastures systems, which will determine if a producer is to make a profit.

IMPLICATIONS

This two-year grazing study indicates the potential of hybrid bromegrass as a pasture species for use by commercial beef producers. The animal performance data showed comparable average daily gains, animal grazing days, and total beef production to existing pasture species already in use in Saskatchewan. Pasture utilization in the first year and grazing period two of the second year followed the expected trend for rankings of these bromegrass species (Ferdinandez and Coulman 2000). In the first year, greater weight gain was recorded from grazing hybrid bromegrass pastures compared to grazing crested wheatgrass pasture. More animal grazing days and total beef production were

obtained from the hybrid bromegrass pastures in 2001 than on the crested wheatgrass pastures. Although total beef production for hybrid bromegrass was not significantly greater than the other species, it did show the highest numerical value. This would indicate that hybrid bromegrass could fit well into a livestock grazing system. Finally, the performance of steers grazing hybrid bromegrass pastures at Lanigan, Saskatchewan; indicate that this grass species is a viable alternative for use as pasture forage.

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PERSONNEL INVOLVED

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Dr. Roger Cohen, Professor, Department of Animal & Poultry Science, University of Saskatchewan

Dr. Bruce Coulman, Research Scientist, Saskatoon Research Station, Agriculture & Agri-Food Canada

PROJECT EXTENSION ACTIVTIES

Presentations

(i) WBDC Summer Field Day, June 2001
(ii) WBDC Summer Field Day, June 2000
(iii) Meacham Hills Forage Club Meeting, September 2000

Publications & Posters

Steer performance grazing hybrid bromegrass pastures. Canadian Journal of Animal Science. (accepted, in press) March 2003.

Nutritive Valure of Smooth, Meadow and Hybrid Bromegrass at Four Phenological Growth Stages. Poster Presentation, Manitoba Grazing School, Brandon, MB. December, 2002.

Dual purpose variety for grazing. Alberta Beef Magazine, Vol 4, No. November 2002.

New hybrid brome provides hay to store, grass to graze. Western Producer, Vol. 78, No. 22. July, 2001.

New Grass Variety for Beef Production. Western Beef Development Centre 2001 Annual Project Report.

Bromegrass: Does it perform as a grazing species? Western Beef Development Centre Fall 2000 Newsletter.

Travel:

Leanne Thompson attended Society for Range Management Annual Conference, Kansas City, Missouri, January 2001.

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Table 1. Steer performance grazing four pasture types

	Grazing Period	CWG[z]	SBG	MBG	HBG	SEM[y]
Average daily gain ($kg\ d^{-1}$)						
2000	1	1.03*b*	1.25*ab*	1.36*ab*	1.62*a*	0.07
2001	1	1.57*a*	0.53*b*	0.78*b*	0.74*b*	0.10
	2	-	1.02	1.10	1.39	0.07
	Mean	1.57*a*	0.77*b*	0.94*b*	1.07*b*	0.07
Animal grazing days ($d\ ha^{-1}$)						
2000	1	97	106	93	99	3.44
2001	1	72	82	79	102	5.68
	2	-	60	74	79	4.14
	Total	72*b*	142*ab*	153*ab*	181*a*	17.17
Total beef production ($kg\ ha^{-1}$)						
2000	1	101	133	126	160	15.09
2001	1	117*a*	69*b*	79*b*	75*b*	7.77
	2	-	69	81	110	10.60
	Total	117	140	160	185	13.30

[z]CWG=crested wheatgrass; SBG=smooth bromegrass; MBG=meadow bromegrass; HBG=hybrid bromegrass
[y]SEM=standard error of the mean
a-b Means in the same row with different letters are different ($P<0.05$)

Table 2. Utilization of available forage by steers grazing four pasture types (%)

	Grazing Period	CWG[z]	SBG	MBG	HBG	SEM[y]
2000	1	47.5*b*	58.5*a*	46.5*b*	52.0*ab*	2.0
2001	1	56.0*a*	44.0*b*	56.2*a*	50.3*ab*	2.1
	2	-	47.9*a*	35.2*b*	33.1*b*	3.0
	Mean	56.0	46.0	45.7	41.7	3.2

[z]CWG=crested wheatgrass; SBG=smooth bromegrass; MBG=meadow bromegrass; HBG=hybrid bromegrass

[y]SEM=standard error of the mean

a-b Means in the same row with different letters are different ($P<0.05$)

Table 4.1 Cumulative dry matter yield (kg ha-1) of above ground biomass of study grasses in 2000 and 2001

Year	Grazing Period	Grass				SEM
		CWG	SB	MB	HB	
		kg ha^{-1}				
2000	1	5870	7390	6540	7036	320
2001	1	2731	3809	3220	4076	346
	2	-	1109	1485	1806	280
	Total	2731	5072	4705	5881	606

Table 4.2 Pasture quality of study grasses at the start of grazing period 1 in 2000 and 2001

	2000					2001				
	CWG	SB	MB	HB	SEM	CWG	SB	MB	HB	SEM
	g kg^{-1}									
ADF	387a	280c	305b	295bc	15.9	369	335	343	335	7.5
NDF	620a	510b	538b	524b	16.6	605	581	565	594	9.8
CP	77c	214a	190b	195b	20.4	174	190	189	186	3.4
ADL	37a	12b	17b	15b	3.8	32	26	30	25	1.7
IVDMD	648	644	748	683	18.8	604b	679b	736a	730a	21.0

a-c Means within a row followed by the same letter are not significantly different ($p<0.05$)

Table 4.3 Pasture quality of study grasses at the end of grazing period 1 in 2000 and 2001

	2000					2001				
	CWG	SB	MB	HB	SEM	CWG	SB	MB	HB	SEM
	g kg^{-1}									
ADF	391a	350bc	339c	385ab	9.0	401a	320b	345ab	337b	12.8
NDF	652a	581c	571c	615b	12.4	652a	517b	522b	528b	23.1
CP	110b	154a	166a	166a	8.83	133b	223a	220a	226a	15.3
ADL	44a	27bc	21c	33b	3.3	43a	17b	18b	22b	4.0
IVDMD	612b	643ab	717a	586b	20.8	595c	698b	770a	758a	26.7

a-c Means within a row followed by the same letter are not significantly different ($p<0.05$)

Table 4.4 **Pasture quality of study grasses at the start of grazing period 2 in 2001**

	CWG	SB	MB	HB	SEM
			g kg $^{-1}$		
ADF	-	347	341	339	3.9
NDF	-	576	527	542	10.5
CP	-	178c	198b	207a	5.5
ADL	-	27ab	24b	28a	0.8
IVDMD	-	712	715	663	14.9

a-c Means within a row followed by the same letter are not significantly different ($p<0.05$)

Table 4.5 **Pasture quality of study grasses at the end of grazing period 2 in 2001**

	CWG	SB	MB	HB	SEM
			g kg $^{-1}$		
ADF	-	366	368	374	7.4
NDF	-	605	575	593	9.2
CP	-	168	173	178	4.6
ADL	-	28	27	33	1.3
IVDMD	-	713ab	801a	677b	25.8

a-c Means within a row followed by the same letter are not significantly different ($p<0.05$)

TABLE 5. COST AND RETURNS OF GRAIN VS FORAGE BASED SYSTEMS

	Lanigan Spring Wheat	Lanigan Feed Barley	Lanigan-Watrous Area Yearlings on CWG and RWR ($/Acre)	Crested Wheatgrass Pasture	Meadow Bromegrass Pasture	Smooth Bromegrass Pasture	Hybrid Bromegrass Pasture
Revenue							
Yield	31.5 bushels	48.5 bushels	2.47 animals/acre	636 lb	1248	1361 lb	1304 lb
Value of Calves Ending (926 lbs @ $.97/lb)			2218.60				
Total $ Gain				254.4	499.20	544.51	521.47
Crop Revenue	148.05	112.03					
Total Revenue ($/Acre)	**148.05**	**112.03**	**2218.60**	**31.80**	**62.40**	**68.06**	**65.18**
Variable Costs							
Value of Calves Entering (650 lbs @ $1.20/lb.)			1926.60				
Supplemental Feed and Minerals			39.40				
Vet Costs			11.12	5.00	5.00	5.00	5.00
Seed*	7.19	6.65			2.40	2.40	2.40
Chemical	18.67	17.56	41.88		5.23	5.23	5.23
Fuel	8.40	8.40	8.37				
Repairs	9.60	9.60	1.88				
Crop Insurance Premium	2.12	1.82					
Utilities/Office/Miscellaneous	4.36	4.36	0.49				
Fertilizer	22.80	22.80	2.20	3.30	3.30	3.30	3.30
Custom Work	6.25	6.25			6.90	6.90	6.90
Interest	2.04	1.94	77.58				
Total Variable Costs ($/Acre)	**81.43**	**79.38**	**2109.52**	**8.30**	**22.83**	**22.83**	**22.83**
Fixed Costs							
Building and Fence Repair Depreciation	1.60	1.60	14.38	3.60	3.60	3.60	3.60
Machinery Depreciation	16.00	16.00	10.13				
Water System			10.77	2.69	2.69	2.69	2.69
Grass Establishment Costs (Depreciated over 20 years)			4.99		4.99	4.99	4.99
Insurance and Liscence			5.00				
Land and Building Investment	19.01	19.01	19.01				
Property Taxes	5.28	5.28	5.28	2.00	2.00	2.00	2.00
Total Fixed Costs ($/Acre)	**41.89**	**41.89**	**69.56**	**8.29**	**13.28**	**13.28**	**13.28**
Total Costs ($/Acre)	**123.32**	**121.27**	**2179.08**	**16.59**	**36.11**	**36.11**	**36.11**
Return to Labour and Equity and Personal Draw ($/Acre)	**24.73**	**-9.24**	**39.52**	**15.21**	**26.29**	**31.95**	**29.07**

* CWG Seed and Seeding Costs Depreciated Over 20 years, Meadow, Smooth and Hybrid Brome Seed and Seeding Costs Depreciated over 12.5 years

Nutritive Value of Smooth, Meadow and Hybrid Bromegrass at Four Phenological Growth Stages

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Introduction

A new hybrid variety of bromegrass was developed by Agriculture and Agri-Food Canada and will be commercially available in spring 2002 as 'AC Knowles'. This hybrid was developed to be a multi-purpose forage for use in beef production systems. This cultivar was developed through hybridization and recurrent selection using smooth bromegrass and meadow bromegrass as parent species. Due to differences in growth and morphology, smooth bromegrass is recommended as a hay species, while meadow bromegrass is recommended as a pasture species. The hybrid variety developed combines the desirable traits of the two parent species resulting in a forage suitable for both hay production and pasture use. Characterizing the nutritive value of 'AC Knowles' hybrid bromegrass compared to the parental species should be done before its use in the industry. It is also important to study the shift in nutritional constituents that occur as physiological maturity approaches. Finally, the nutritional quality of this grass should be related to the requirements of the grazing animal.

Objectives

- To determine the nutritive value of 'AC Knowles' hybrid bromegrass at four different growth stages.
- Compare this new forage to the nutritional value of it's parental species, smooth bromegrass and meadow bromegrass.

Materials and Methods

- Field plots were located at the Agriculture and Agri-Food Canada Research Centre farm in Saskatoon Saskatchewan. The soil type was Sutherland clay loam (Typic Haploboroll).
- The three grasses were seeded in spring, 1993 in four row plots 1.25 X 6 m. Seeding rates were 12 gm plot^{-1} for 'Carlton' smooth bromegrass, and 15 gm plot^{-1} for 'Paddock' meadow bromegrass as well as 'AC Knowles' hybrid bromegrass. Experimental design was a randomized complete block.
- Samples were collected in 2000 and 2001 at the stem elongation, heading, anthesis and regrowth stages of development and analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin, crude protein (CP), and in vitro dry matter digestibility (IVDMD).
- Means for each grass at each stage were calculated using the Proc GLM procedure of SAS and comparisons were done using LSD. Means are presented separately for 2000 and 2001 due to a significant year effect ($P<0.05$).

Results

- At stem elongation in 2000, hybrid was intermediate to smooth and meadow for NDF. However, hybrid had the lowest ADF. Hybrid had less lignin that meadow, but was not different than smooth. Hybrid had the highest IVDMD. In 2001, smooth and hybrid were not different in NDF, ADF or lignin but were lower than meadow. Hybrid and smooth were not different in IVDMD but hybrid was higher than meadow ($P<.05$).
- At heading in 2000, hybrid was lower than meadow, but was not different than smooth. In 2001, smooth was lower in ADF than meadow, but not different than hybrid. Smooth was also lower in lignin than both meadow and hybrid ($P<.05$).
- At anthesis in 2000, smooth was lower than meadow in ADF, but was not different from hybrid. Meadow was lower than smooth in lignin, but was not different than hybrid. Hybrid was higher in IVDMD than both smooth and meadow. In 2001, lignin was lower in meadow than in smooth, but not different from hybrid ($P<.05$).

Table 1. Mean nutritive value of smooth, meadow and hybrid bromegrass at stem elongation in 2000 and 2001.

Cultivar/Grass	NDF	ADF	Lignin	CP	IVDMD
			g Kg^{-1}		
2000					
'Carlton Smooth bromegrass	455.6^{b}	262.2^{a}	16.0^{ab}	147.9	692.2^{a}
'Paddock' Meadow bromegrass	491.0^{a}	287.2^{a}	19.1^{a}	139.0	735.4^{b}
'AC Knowles' Hybrid bromegrass	479.5^{ab}	241.7^{b}	12.3^{b}	134.1	764.1^{a}
Mean	475.4	257.0	15.8	140.3	730.6
LSD	25.68	13.30	5.47	27.66	28.47
2001					
'Carlton Smooth bromegrass	472.8^{b}	252.6^{b}	14.5^{b}	180.2	700.4^{ab}
'Paddock' Meadow bromegrass	516.1^{a}	309.6^{a}	19.2^{a}	160.3	681.7^{b}
'AC Knowles' Hybrid bromegrass	486.2^{b}	271.4^{b}	14.5^{b}	163.9	711.9^{a}
Mean	491.11	277.79	16.1	168.1	698.0
LSD	27.93	22.06	2.74	24.29	29.18

a-c Means in a column within the same year with the same letter are not significantly different ($p=0.05$)

Table 2. Mean nutritive value of smooth, meadow and hybrid bromegrass at heading in 2000 and 2001.

Cultivar/Grass	NDF	ADF	Lignin	CP	IVDMD
			g Kg^{-1}		
2000					
'Carlton Smooth bromegrass	497.8^{ab}	282.1	18.4	135.1	719.1
'Paddock' Meadow bromegrass	477.6^{b}	285.6	19.5	131.4	724.0
'AC Knowles' Hybrid bromegrass	503.2^{a}	279.9	18.0	138.2	696.6
Mean	492.8	275.9	18.6	141.5	713.2
LSD	22.90	23.80	2.96	30.91	43.16
2001					
'Carlton Smooth bromegrass	466.9	259.3^{b}	18.3^{b}	159.5	702.3
'Paddock' Meadow bromegrass	479.3	299.4^{a}	24.1^{a}	154.9	697.8
'AC Knowles' Hybrid bromegrass	479.1	282.3^{ab}	23.5^{a}	149.2	701.2
Mean	475.1	280.3	21.9	154.5	700.4
LSD	15.74	29.57	2.70	23.53	16.53

a-c Means in a column within the same year with the same letter are not significantly different ($p=0.05$)

Table 3. Mean nutritive value of smooth, meadow and hybrid bromegrass at anthesis in 200 and 2001.

Cultivar/Grass	NDF	ADF	Lignin	CP	IVDMD
			g Kg^{-1}		
2000					
'Carlton Smooth bromegrass	514.8	280.9^{b}	22.8^{a}	128.7	630.5^{b}
'Paddock' Meadow bromegrass	529.7	300.9^{a}	20.2^{b}	122.0	637.7^{b}
'AC Knowles' Hybrid bromegrass	534.9	295.3^{ab}	21.2^{ab}	114.7	702.7^{a}
Mean	526.4	292.4	21.4	121.8	657.0
LSD	23.56	14.83	2.66	39.62	34.80
2001					
'Carlton Smooth bromegrass	508.3	274.4	25.6^{a}	150.6	613.9
'Paddock' Meadow bromegrass	495.3	279.2	22.1^{b}	149.6	544.0
'AC Knowles' Hybrid bromegrass	500.6	269.6	23.3^{ab}	145.1	511.4
Mean	501.5	274.4	23.7	148.5	556.4
LSD	41.12	22.76	2.38	28.68	137.99

a-c Means in a column within a year with the same letter are not significantly different ($p=0.05$)

Table 4. Mean nutritive value of smooth, meadow and hybrid bromegrass at regrowth in 2000 and 2001.

Cultivar/Grass	NDF	ADF	Lignin	CP	IVDMD
			g Kg^{-1}		
2000					
'Carlton Smooth bromegrass	487.1^{b}	314.3^{a}	30.5	142.1^{a}	714.1^{a}
'Paddock' Meadow bromegrass	563.9^{a}	385.8^{a}	28.5	99.4^{b}	665.7^{b}
'AC Knowles' Hybrid bromegrass	501.3^{b}	337.0^{b}	30.5	123.2^{a}	679.4^{b}
Mean	518.1	345.7	29.8	121.6	686.7
LSD	18.15	16.10	5.84	21.32	26.87
2001					
'Carlton Smooth bromegrass	381.5	236.4^{b}	22.3	203.5	571.0
'Paddock' Meadow bromegrass	410.2	266.6^{a}	23.8	195.4	515.9
'AC Knowles' Hybrid bromegrass	403.8	254.3^{ab}	22.7	191.0	568.4
Mean	398.5	252.5	22.9	196.6	551.8
LSD	35.36	23.40	3.40	21.45	134.34

a-c Means in a column within the same year with the same letter are not significantly different ($p=0.05$)

- At regrowth in 2000, smooth and hybrid were not different in NDF, but both were lower than meadow. Smooth was lowest in ADF followed by hybrid, and meadow. Meadow was lower in CP than hybrid which was not different than smooth. Smooth had the highest IVDMD. In 2001, smooth was lower in ADF than meadow, but was not different than hybrid ($P<.05$).

Conclusions

Results from this study suggest that hybrid bromegrass has potential as an alternative forage in beef production systems. When compared to the parent species, it was often intermediate for the nutritional parameters measured. However, at stem elongation and heading, hybrid bromegrass was found to have a higher IVDMD than the parent species. This is an advantage to the grazing animal as an increase in digestibility will be related to a greater amount of retained nutrients.

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New hybrid brome provides hay to store, grass to graze

By Adrian Ewins
Saskatoon newsroom

LANIGAN, Sask. — A certain brand of mint, according to a famous advertising slogan, was "two, two — two mints in one."

While there's no commercial in the works for hybrid brome grass, a similar slogan might be appropriate.

The new forage crop developed by Agriculture Canada can aptly be described as two grasses in one.

It's a hay grass, providing producers with a good first cut yield like its parent smooth brome.

And it's a grazing grass, regrowing through the summer and fall like its other parent, meadow brome.

"You can use it as a dual purpose hay-pasture type of crop," says Bruce Coulman, head of forage crops research at Agriculture Canada's Saskatoon centre. "That's the benefit to the producer."

He said the feedback so far has been enthusiastic.

"It gives them an option," he said. "A lot of beef producers like to take a first cut of hay and then graze afterwards."

The new brome grass, named AC Knowles in honour of Bob Knowles, the Ag Canada scientist who developed it, was on display June 27 at the Western Beef Development Centre's Termuende research farm near Lanigan, about 120 kilometres east of Saskatoon.

Cattle producers heard about the new brome grass, AC Knowles, and visited several research sites.

Nearly 300 farmers attended the annual field day to check out the trade show, listen to a few speeches, swap stories with their fellow cattle producers and head out in the buses to tour some of the research projects.

One is comparing plant yield, plant nutrition and animal performance data for the three varieties of brome grass, along with crested wheat grass.

Early trial results

Since the project is in only its second year, it's too early to report any concrete conclusions. However, Coulman said that earlier small-scale grazing trials at the Swift Current research centre produced promising results.

"That showed it was at least as good, if not better, in terms of animal gain than smooth and meadow," he said. "So now we want to evaluate it in this setting as well."

The hybrid's hay yields are about equal to smooth and greater than meadow, while its pasture yield is better than smooth and comparable to meadow.

With good moisture, the grass can be ready for grazing three weeks after cutting, although on average it would be four to five weeks.

Hybrid brome has lower fibre in the earlier growth stages, then shows equivalence to the other brome grasses during later stages. Crude protein levels are lower at advanced stages.

Meadow and smooth brome won't normally cross in the field because meadow brome flowers quite a bit earlier than smooth.

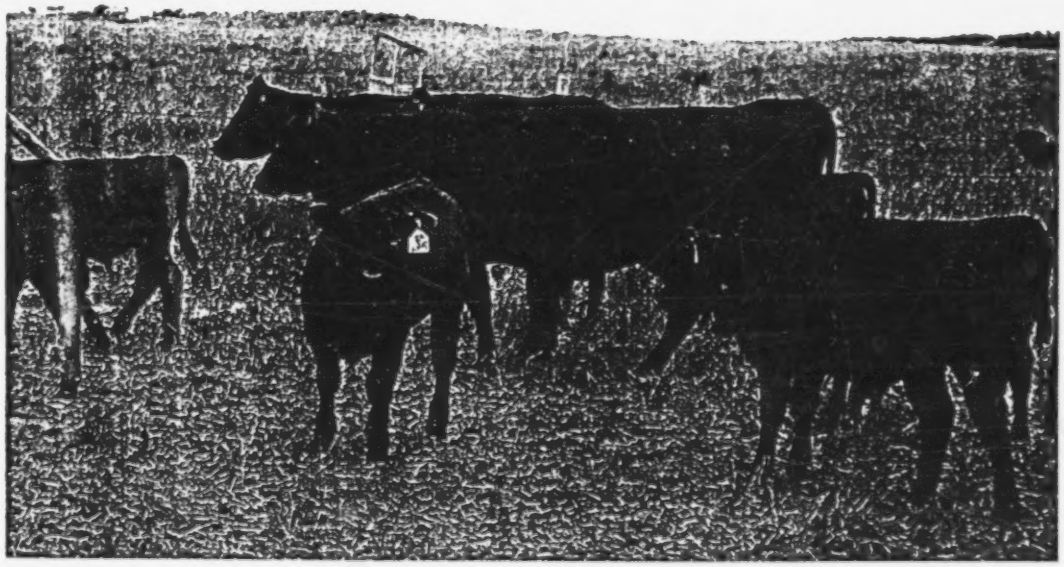
Ron Bilokreli from Theodore, Sask., compares samples of brome grasses at the Western Beef Development Centre's Termuende research farm near Lanigan, Sask. (WP photos by Adrian Ewins)

Bart Lardner, the beef centre's coordinator of research and technology transfer, said the project has been hurt by dry conditions in the last two years.

Steers have been grazing on the plants for three weeks but will soon be taken off to give the pasture a three-week rest. They will return in late July.

All of the brome grasses are fairly drought tolerant. When meadow brome gets drought stressed, the leaves turn brown, but come back quickly with rain. Smooth brome is deeper rooted and the leaves stay green in dry conditions, as they do with the hybrid.

Western Beef
Development Centre



2001
Annual Project Report

New Grass Variety for Beef Producers

Introduction

When making seeding decisions concerning perennial forages, the end-use of that forage crop should always be considered. Is the primary requirement for hay or pasture, or both? One option soon to be available commercially is a new forage variety known as 'AC Knowles' hybrid bromegrass. This cultivar was developed by Agriculture and Agri-Food Canada (AAFC) and is an inter-specific hybrid between smooth bromegrass and meadow bromegrass. Due to differences in growth and morphology, smooth bromegrass is typically recommended as a hay-type species while meadow bromegrass is recommended as a pasture species. This new hybrid combines features of the two parent species resulting in a multi-purpose type forage for use in western Canada. Several years of grazing and production data have already been collected on this hybrid from the Brown soil zone (AAFC, Swift Current). However only one year of data has been collected from the Black soil zone (AAFC, Melfort). From information collected in the Brown soil zone, the new hybrid seems to show intermediate growth characteristics; better yielding than meadow bromegrass for hay production and better regrowth than smooth bromegrass for grazing purposes.

A two-year study, supported by Saskatchewan Agriculture Development Fund, was initiated to compare the grazing characteristics of meadow bromegrass/smooth bromegrass hybrid ('AC Knowles'), meadow bromegrass ('Paddock'), smooth bromegrass ('Carlton') and crested wheatgrass (cultivar unknown). The study site was located at the Termuende Research Farm near Lanigan, SK., which is situated on thin Black Oxbow soil. The trial design was two 2-acre replicates each of meadow bromegrass, smooth bromegrass, and the hybrid bromegrass. All bromegrass species were established in July of 1999. Additionally, two 2-acre replicates of long established crested wheatgrass pasture (cultivar unknown) were included as the control.

Pastures were grazed using British X Continental steers for one grazing period in 2000 and two periods in 2001. Prior to grazing all animals were weighed and randomly allocated to a pasture type. Water was provided to each paddock by a tub and animals had free choice range mineral available. Stocking rate on all replicates was set at 1 AUM/acre. Animals were then weighed weekly and at the end of each grazing period. A put-and-take stocking rate was employed with three tester animals on all paddocks.

Forage yield estimates were obtained by collecting weekly samples from on all 4 grass species during each grazing period in each year using a 0.25m^2 quadrat and are reported in Tables 1 and 2.

Table 1 Cumulative yield of above ground biomass - 2000 and 2001

Pasture Type	Dry matter yield		
	Kg/ha	Lb/ac	Ton/ac
Crested wheatgrass	5212	4649	2.32
'Carlton' smooth bromegrass	6282	5604	2.80
'Paddock' meadow bromegrass	5117	4564	2.28
'AC Knowles' hybrid bromegrass	5426	4840	2.42

Table 2 Cumulative yield of above ground biomass by grazing period for 2000 and 2001

Pasture Type				
	Kg/ha		Lb/ac	
Grazing Period	1	2	1	2
Crested wheatgrass	5212	-	4649	-
'Carlton' smooth bromegrass	6139	732	5476	653
'Paddock' meadow bromegrass	4678	877	4173	782
'AC Knowles' hybrid bromegrass	5155	460	4598	410

Results from the two years showed no significant differences in dry matter yield between all grass species. However, smooth bromegrass was numerically greater than the other pasture types during this trial, even under grazing conditions. This greater performance may be due to an increased tolerance to drought for the smooth bromegrass due to a deeper rooting system. During this trial, there was below normal precipitation in both years. The lack of sufficient moisture may have impacted any regrowth potential of both the meadow and hybrid bromegrass.

All bromegrass paddocks were able to accumulate enough regrowth to warrant a second grazing period in 2001 showing an advantage over the crested wheatgrass pastures, which remained dormant in early July. The yield data in the second grazing period did not reflect the regrowth ability of the hybrid bromegrass. Meadow bromegrass yield was greater but not significantly different than smooth or hybrid bromegrass.

Hybrid bromegrass had the second highest IVDMD of the grasses at initiation of grazing and this trend followed through the grazing periods (Table 3). The high digestibility of the forage combined with the increased animal grazing days noted on this species would have a positive impact on total animal production.

Table 3. Composition of forage at initiation of grazing in 2000 and 2001

Species	CP	NDF	ADF	Lignin	IVDMD
			(%)		
Crested wheatgrass	12.6	61.2	37.8	3.4	62.6
Smooth bromegrass	20.2	54.6	30.7	1.9	66.1
Meadow bromegrass	19.0	55.1	32.4	2.0	74.2
Hybrid bromegrass	19.0	55.9	31.5	2.4	70.7

CP=crude protein, NDF=neutral detergent fiber, ADF=acid detergent fiber, IVDMD=in vitro dry matter digestibility

Grazing on the crested wheatgrass paddocks commended May 23 in both 2000 and 2001 and on all three types of bromegrass paddocks June 23 of 2000 and June 6 of 2001. The length of the grazing period on individual paddocks was determined by available herbage (i.e. animals removed from a paddock at a stubble height of approximately three inches). In 2000 there was only one grazing period for all paddocks due to lack of regrowth. In 2001 two grazing periods were obtained on the bromegrass paddocks and one on the crested wheatgrass paddocks. Steer performance is shown in Table 4.

Steers grazed the crested wheatgrass and brome pastures in 2000, 44 and 38 days, respectively. In 2001, the crested wheatgrass was grazed 21 days and the brome pastures 21 days in both rotations. There were no significant differences in steer average daily gain noted between grass species. However, steer performance was numerically greater on the 'AC Knowles' hybrid bromegrass paddocks during both grazing periods than steer gains on the meadow or smooth bromegrass pastures. Animal grazing days and total animal production were also greater on the hybrid bromegrass pastures. This may be related to the differences noted in pasture quality (Table 3). Steer gains on crested wheatgrass paddocks were similar to the hybrid bromegrass, however this pasture type provided no grazing beyond June 23 in both years.

When comparing average daily gains (Table 4) against dry matter yield of the grasses (Table 1), it is interesting that animals grazing the most productive grass did not experience the highest average daily gains, or total gain per acre. Although smooth bromegrass was the most productive species, average daily gain of the steers on this forage was very similar to the steers grazing crested wheatgrass. This may be a result of difference in forage quality among these four grasses. Research at AAFC Lacombe has shown that smooth bromegrass has a lower digestibility than meadow bromegrass, thus providing less energy than meadow bromegrass at advanced maturity. Crested wheatgrass has also been shown to have a higher fiber content, and may become quite "stemmy" as it matures, thus decreasing intake and reducing animal gains.

Table 4. Steer performance on four different grass pasture types 2000 & 2001

	Grazing period	CWG	Smooth brome	Meadow brome	Hybrid brome
Average daily gain (lb/day)	1	3.1	2.4	2.4	2.8
	2	-	2.2	2.1	3.1
Animal grazing days (days/acre)	1	83	94	86	97
	2	-	67	74	79
Total steer production (lb/ac)	1	96	84	92	114
	2	-	37	62	75

Animal grazing days=(AU/area)*days, total animal production=adg*agd

From this study, it seems that hybrid bromegrass has good potential to perform as pasture forage for beef production systems. Under these grazing conditions it was very similar in quality and yield to the parent meadow bromegrass. The highest total beef gains per acre and average daily gains were observed from animals grazing the hybrid bromegrass. These data suggest that hybrid bromegrass provides a good balance between productivity (dry matter yield) and nutritional quality. Further research should look at performance of hybrid bromegrass when taking hay cut followed by grazing treatment in relation to the parent species.

SHORT COMMUNICATION

Steer performance grazing hybrid bromegrass pastures

Short Title: Steer gains on grass pastures

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Abbreviations: ADG, average daily gain; **AGD,** animal grazing days; **TBP**, total beef production

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Producers in Saskatchewan require grazing information on new grass cultivars to improve production and quality of existing forage stands. Animal data are ultimately needed to validate the performance of these new varieties under grazed conditions. A 2-yr field experiment was conducted (2000-2001) to determine steer performance and species utilization when grazing crested wheatgrass (*Agropyron pectiniforme* R. & S.), smooth bromegrass (*Bromus inermis* Leyss.) and meadow bromegrass (*Bromus riparius* Rehm.) compared to hybrid bromegrass (*Bromus riparius X Bromus inermis*) pasture on an Orthic Black soil in east central Saskatchewan. Weight gain (kg d^{-1}) was greater ($P<0.05$) for steers grazing hybrid bromegrass pasture than crested wheatgrass pasture in the first year. However, in 2001 steers grazing crested wheatgrass pastures had greater ($P<0.05$) average daily gain than other pasture types. Total beef production was greatest in both years (160 and 185 kg ha^{-1}) from the hybrid bromegrass pastures. The greatest ($P<0.05$) animal grazing days were observed on hybrid bromegrass pastures than any other pasture species. These results suggest that AC Knowles hybrid bromegrass is a suitable species for pasture use in Saskatchewan.

Key words: Grazing, utilization, steer, grass pasture